

gas- and liquid-permeable second electrode (5), divided by a media-sealing, electrically isolating peripheral seal (3) into a first housing part (2.1) and a second housing part (2.2);

a selectively ion-permeable membrane electrolyte (6) arranged between the electrode faces (4.2, 5.2) with said porous electrodes (4, 5) a mechanically stable composite unit, in which a slit-shaped gas channel (7) formed by the first electrode face (4.1) facing away from the membrane electrolyte (6) and the first housing part (2.1) and through which a vapor-saturated, ion-generating carrier gas (G,V) along with the vapor component flows;

a slit-shaped liquid channel (8) formed by the second electrode face (5.1) facing away from the membrane electrolyte (6) and the second housing part (2.2) through which a vapor-absorbing solution (S) flows;

wherein the electrodes are short-circuited by current lead-in and lead-off systems (9) (10), and an external load resistor (11), feeding vapor-saturated carrier gas (G,V) with a first vapor partial pressure via an inlet opening (12.1) in the first housing part (2.1) to the gas channel (7), and a reduced quantity of vapor-saturated gas (G,V)_m with a second vapor partial pressure is carried off via an outlet opening (12.2), said first vapor partial pressure in the carrier gas being greater than said second vapor partial pressure;

feeding an undersaturated solution (S)p with a first content of the vapor component via an inlet opening (13.1) in the second housing part (2.2) to the liquid channel 8 and carrying off a saturated solution (S)r with a second content of the vapor component and a vapor saturated carrier gas (G,V)p with an adapted vapor partial pressure via an outlet opening (13.2), said first content of the vapor component being lower than the second content of the vapor component in the solution, so that when cation-generating carrier gas with a vapor component is used, and a membrane electrolyte (6) selectively admits said cations, cations are formed at a phase boundary (4.2), which is a gas/solid/electrolyte surface of the first electrode (4) as a result of anodic oxidation with the consumption of carrier gas and vapor from the gas channel (7);

said cations migrating through the membrane electrolyte (6) to the second electrode (5) and, at its phase boundary (5.1), which is a gas/liquid/solid surface, increasing the content of the vapor component in the solution flowing in the liquid channel (8) as a result of cathodic reductions with the liberation of an equivalent quantity of carrier gas;

while the electrons from the first electrode (4) flow via the current conduction system (9, 10) and the external load resistor (11) to the second electrode (5); or

when an anion-generating carrier gas with a vapor component and a membrane electrolyte (6) selectively transmitting said anions is used, anions are formed at the phase boundary (4.2) which is a gas/solid/electrolyte surface on the first electrode (4) as a result of cathodic reduction with consumption of carrier gas and vapor from the gas channel (7), said anions migrating through the membrane electrolyte (6) to the second electrode (5) and at its phase boundary (5.1), which is a gas/liquid/solid surface, increases the content of the vapor component in the solution flowing in the liquid channel (8) as a result of anodic oxidation with the liberation of an equivalent quantity of carrier gas;

while electrons from the second electrode (5) flow via the current conduction systems (9, 10) and the external load resistor (11) to the first electrode (4).

31. (New) A process for converting sorption reaction work into useful electrical work by means of a galvanic liquid electrolyte reaction cell (20) comprising feeding to and carrying off a substance system consisting of a vapor/carrier gas mixture and a solution absorbing the vapor in the cell housing (21);

said cell housing (21) containing a flat-shaped, porous, gas-permeable first electrode (23) and a flat-shaped slitless second electrode (24), a media-sealing, electrically

isolating peripheral seal (22) dividing said cell housing (21) into a first housing part (21.1) and a second housing part (23.2) the first electrode (23) and the first housing part (21.1) facing one another for a slit-shaped gas channel (25) through which a vapor-saturated, ion-generating carrier gas (G,V₀) flows along with the vapor component;

the surface (23.1) of the first electrode (23) and the surface (24.1) of the second electrode (24) connecting slitless with the second cell housing part (21.2) facing one another forming a slit-shaped liquid channel (26) through which a vapor absorbing electrolytic solution (S) flows;

wherein the electrodes are electrically short-circuited by current lead-in and lead-off systems (27), (28) and an external load resistor (29), feeding vapor-saturated carrier gas (G,V)_r with a first vapor partial pressure via an inlet opening (30.1) in the first housing part (21.1) to a gas channel (25), and a reduced quantity of vapor-saturated carrier gas (G,V)_m with a second vapor partial pressure is carried off via an outlet opening (30.2), said first vapor partial pressure in the carrier gas being greater than said second vapor partial pressure;

feeding an undersaturated solution (S)_p with a first content of the vapor component via an inlet opening (31.1) in the second housing part (21.2) to the liquid channel (26) and carried off a saturated solution (S)_r with a second content of

the vapor component and a vapor saturated carrier gas (G,V)p with an adapted vapor partial pressure via an outlet opening (31.2), said first content of the vapor component being lower than the second content of the vapor component in the solution, so that when a cation-generating carrier gas with a vapor component is used, cations form at the phase boundary (23.1) which is a gas/solid/electrolyte surface of the first electrode (23) as a result of anodic oxidation with the consumption of carrier gas and vapor from the gas channel (25);

 said cations migrate transversally to the solution flowing through the ion-conducting liquid gap (32) to the second electrode (24) and at its phase boundary (24.1), which is a gas/liquid/solid surface, increasing the content of the vapor component in the solution flowing in the liquid channel (26) as a result of cathodic reduction with the liberation of an equivalent quantity of carrier gas;

 while the electrons from the first electrode (23) flow via the current conduction systems (27, 28) and the external load resistor (29) to the second electrode (24); or
 when an anion-generating carrier gas with a vapor component is used and anions form at the phase boundary (23.1) which is a gas/liquid/solid surface on the first electrode (23) as a result of cathodic reduction with the consumption of carrier gas and vapor from the gas channel (25), said anions

migrate transversally to the solution flowing through the ion-conducting, liquid gap (32) to the second electrode (24) and at its phase boundary (24.1), which is a gas/liquid/solid surface, increasing the content of the vapor component of the solution flowing in the liquid channel (26) as a result of anodic oxidation with the liberation of an equivalent quantity of carrier gas, while electrons from the second electrode (24) flow via the current conduction systems (27, 28) and the external load resistor (29) to the first electrode (23).

32. (New) The process according to claim 30 wherein the substance phase quantities conveyed in the circuit by media-conveying devices are measured so that in the galvanosorptive reaction process the increase of the absorbed vapor component in the solution and the vapor depletion of the carrier gas are stabilized, whereby the overall system pressure is adjusted by the carrier gas filling of the circuit and the carrier gas is at the same level as or greater than the highest vapor partial pressure reached in the ternary substance circulation.

33. (New) The process according to claim 30 wherein the galvanosorptive reaction process taking place in the reaction cell is running adiabatically or non-adiabatically, wherein in the case of non-adiabatic running of

the process the electrode in contact with the solution or its current conducting system has channels distributed uniformly over its area through which a heat transfer medium flows, the heat-transferring walls being medium-impermeable.

34. (New) The galvanosorptive reaction process according to claim 30 wherein any vapor-absorbing solution which is thermally decomposable into a vapor component and a liquid component, apart from the ion-generating and system pressure equalizing carrier gas, can be fed to and carried off,

whereby hydrogen is the cation-generating carrier gas with the vapor component of the solution and oxygen is the anion-generating carrier gas and the substance system involved in the galvanosorptive reaction process as a whole is at least a ternary one, whereby the structural materials of the reaction cell behave inertly with respect to the substance system selected.

35. (New) The process according to claim 33 wherein an activation voltage source assigned to the electrodes permanently delivers a voltage difference with a negligible current flow, whereby this voltage difference is superimposed on the inherent voltage difference of the cell.

36. (New) The process according to claim 31 wherein an electrolytic component with negligible inherent vapor pressure soluble in the liquid component of the solution and which increases the ion conductivity thereof, is added to the ternary substance system.

37. (New) The process according to claim 31 wherein the substance phase quantities conveyed in the circuit by media-conveying devices are measured so that in the galvanosorptive reaction process the increase of the absorbed vapor component in the solution and the vapor depletion of the carrier gas are stabilized, whereby the overall system pressure is adjusted by the carrier gas filling of the circuit and the carrier gas is at the same level as or greater than the highest vapor partial pressure reached in the ternary substance circulation.

38. (New) The process according to claim 31 wherein the galvanosorptive reaction process taking place in the reaction cell is running adiabatically or non-adiabatically, wherein in the case of non-adiabatic running of the process the electrode in contact with the solution or its current conducting system has channels distributed uniformly over its area through which a heat transfer medium flows, the heat-transferring walls being medium-impermeable.

39. (New) The galvanosorptive reaction process according to claim 31 wherein any vapor-absorbing solution which is thermally decomposable into a vapor component and a liquid component, apart from the ion-generating and system pressure equalizing carrier gas, can be fed to and carried off,

whereby hydrogen is the cation-generating carrier gas with the vapor component of the solution and oxygen is the anion-generating carrier gas and the substance system involved in the galvanosorptive reaction process as a whole is at least a ternary one, whereby the structural materials of the reaction cell behave inertly with respect to the substance system selected.

Please amend claim 27 as follows:

27. (Amended) The process according to claim 35 wherein the substance flows fed to and carried off from the reaction cell (50) with external load resistor (56) and connected activation source (57) are formed into an isobaric, ternary substance circuit with the external thermal substance decomposition and external phase separation by the allocation of a heated solution heater (51), a gas vapor enricher (52) combined with a phase separator, a phase separator (53), a solution pump (54) and a gas compressor (55), whereby the two-phase mixture (S)r, (G,V)p carried off from the reaction cell

(50) is fed to the phase separator (53) and the phases (S)r and (G,V)p are separated, the vapor depleted gas (G,V)p carried off at the head of the phase separator (53) is united with the moderately vapor-depleted gas (G,V)m carried off from the reaction cell and the mixture (G,V)x is fed by the gas compressor (55) to the gas vapor enricher (52) and in the gas vapor enricher is conveyed towards the heated and vapor-depleting solution (S)r with vapor uptake and the vapor-enriched gas (G,V)r carried off at the head of the gas vapor enricher (52) is fed again to the reaction cell (50), while the vapor-enriched solution (S)r carried off at the bottom of the phase separator (53) is conveyed by the solution pump (54) through the solution heater (51) and introduced at the head into the gas vapor enricher (52) and the vapor-depleted solution (S)p carried off at the bottom of the gas vapor enricher (2) is fed again to the reaction cell (50).

Please amend claim 28 as follows:

28. (Amended) The process according to claim 32 wherein the substance flows fed to and carried off from the galvanic reaction cell (40) with external load resistor (41) are formed into an isobaric, ternary substance circuit with external thermal substance decomposition and external phase separation thereby that a heated gas vapor enricher (42) combined with a phase separator, a solution recuperator (43),

a solution cooler (44), a phase separator (45), a solution pump (46), and a gas compressor (47), whereby the tow-phase mixture (S)r, (G,V)p carried off from the reaction cell (40) is fed to the phase separator (45) and the phases (S)r and (G,V)p are separated, the vapor-depleted gas (G,V)p carried off at the head of the phase separator (45) is united with the moderately vapor-depleted gas (G,V)m carried off from the reaction cell and the mixture (G,V)x is fed by the gas compressor (47) to the gas vapor enricher (42) and in the gas vapor enricher is conveyed towards the heated vapor-depleting solution (s)r with vapor uptake and the vapor-enriched gas (G,V)r carried off at the head of the gas vapor enricher (42) is fed again to the reaction cell (40), while the vapor-enriched solution (S)r carried off from the phase separator (45) is conveyed by the solution pump (46) through the secondary side of the solution recuperator (43)(41) and introduced at the head into the gas vapor enricher (42) and the vapor-depleted solution (S)p is carried off at the bottom of the gas vapor enricher (42), passed through the primary side of the solution recuperator (43) and through the solution cooler (44) and fed again to the reaction cell (40).